Meet the Land Cover/ Biology Team

Duplicate and distribute to students.

This section represents a combined effort between the Biometry and Accuracy Assessment teams at the University of New Hampshire to form the Land Cover Investigation. Dr. Russell Congalton is the science Principal Investigator and Dr. Mimi Becker is the education Principal Investigator for the Accuracy Assessment Team. Dr. David Bartlett is the science Principal Investigator and Dr. Eleanor Abrams is the education Principal Investigator for the Biometry team. Mr. Gary Lauten is a project scientist with the Biometry team. This interview is with these members of the Land Cover Investigation.

Dr. Congalton: I deal with satellite data, aerial photography, and remote sensing or mapping land cover pretty much all over the world. My degrees are in forestry. People don't think of forestry as a science, but it's very science-based and interdisciplinary. You need physics, computers, biology, statistics and math in order to put it together.

GLOBE: *When I think forestry, I think being out there in the forest—*

Dr. Congalton: —and playing chess with Smokey the Bear.

GLOBE: *And being in a tower overlooking the wilderness. Now you're at a university. What was your image of forestry back then?*

Dr. Congalton: It wasn't Smokey the Bear. I never thought that I would live in the middle of nowhere and wash my clothes in a stream. I still get to go to the woods on a regular basis. I like being in the office when it's raining or snowing. I like playing on the computer.

GLOBE: *Do you spend time in a laboratory?*

Dr. Congalton: My laboratory is the computer laboratory. The computers allow us to do statistical analyses as well as manipulation of the satellite data, the aerial photography, for our mapping purposes.

GLOBE: *Is most of the information you're working with from the sky?*

Dr. Congalton: Yes, but we need to verify the satellite data with what's happening on the ground. There are some things you can't tell from satellite data, like a species of plant that's too small for satellite photographs to capture. We want to validate the maps made from remotely-sensed data over the last few years so we can see what's changing on the Earth. We've never determined how good the satellite data or photography is for a lot of areas. We need to know how good the remotely-sensed satellite data is in order to verify the decisions we make based on this data.

GLOBE: *What kind of decisions?*

Dr. Congalton: There are many estimates of land cover in the Amazon. There's actually never been an accurate assessment of this. People publish figures saying, "X amount of trees are being cut a day," but there's never been an accuracy assessment to determine if that's really true.

Dr. Bartlett: We're using computer models and our knowledge of, for example, how plants utilize sunlight, water and nutrients in order to simulate and ultimately predict the behavior of ecosystems. GLOBE students can help. In trying to replicate conditions of a particular area, for example, you need to know what kind of vegetation is there and its environmental conditions. The GLOBE data provides that information. GLOBE is also important for validation. Validating models is a process of running the model and comparing the results to measurements in the real world.

GLOBE: *By modeling, we're talking about predicting the future given certain parameters?*

Dr. Bartlett: Predicting change. What if I change the average annual temperature by five degrees? Or reduce the average annual precipitation in this region by 50 centimeters? Put that into the model and see what it predicts. That's the real power of modeling, but it relies on comparing the output to real data, and the only real data we currently have is from our limited resources and the data from students.

GLOBE: *What is remotely-sensed data?*

Dr. Bartlett: In the context of GLOBE, we're primarily talking about satellite data. Satellites have an advantage in that they collect data for long periods of time. This is what is needed for global environmental monitoring.

GLOBE: *What is the satellite actually seeing or measuring? Can it detect vegetation? "Hey, that's green. That must be grass?"*

Mr. Lauten: A satellite doesn't know what it sees. All it sees is a brightness from a portion of the ground. Landsat sees visible plus near infrared and middle infrared radiation. Essentially it can see what your eyes see, as well as the near infrared and middle infrared.

GLOBE: *Have students ever helped verify satellite data?*

Dr. Congalton: Not that I know of. And certainly not at GLOBE's scale.

GLOBE: *A common perception of scientists is they're lone-wolf types working in their laboratories late at night. But that doesn't seem to be the case here. Here it's collaborative. Why is that?*

Dr. Becker: We're dealing with complex systems at the global and local levels. Most of the work we do is interdisciplinary, so we have to work together to solve problems.

Dr. Bartlett: GLOBE is a unique collaboration between science and science education. No one person can provide expertise in all the facets of world-class environmental science as well as science concepts for young students. It's common for people in our line of work to work with scientists in other disciplines.

GLOBE: *What question are you trying to answer with the GLOBE data?*

Dr. Bartlett: How the Earth as a whole system works. However, the Earth is very complex. One way to simplify that problem is to look for processes that link those diverse parts of the system. For example, there are a small number of important materials, compounds and nutrients that living things in one way or another need and use during their lifetimes. Those include water, carbon, nitrogen, sulfur, sunlight. All plants, whether they be in arid environments or tropical environments, need some combination of those to exist. So we investigate the cycling of those materials to try to produce a picture of how vegetation operates. And although it can't do everything, remote sensing has a role to play in that.

Dr. Becker: As a policy scientist, I'm concerned with how people relate to the ecosystem. How can we maintain healthy regional and global systems in the face of continuing human stress? Where we have severely impaired systems, are there ways we can constrain human behavior so that basic ecological functions are restored? What kinds of decisions does that involve? What kind of information do we need to change policy and educate people?

GLOBE: *You are a policy scientist?*

Dr. Becker: I'm a natural-resource and environmental-policy scientist, so I'm interested in relationships between humans and their communities, and the Earth systems that support them.

GLOBE: *As a woman, what were your attitudes toward science when you were in middle school and high school?*

Dr. Becker: They evolved. I came through a period of time when women were not expected to do either science or math. I still have a certain amount of math phobia, although I can do it when I have to. My father was a photographer and I fooled around with chemicals and worked in darkrooms.

GLOBE: *What are you going to do with your findings?*

Dr. Becker: For example, there are issues that relate to water shortages or land-use activities. The only way they're going to get solved is locally. So I'll be looking to collaborate with students in those areas where I know problems exist. We'll try to understand what's going on and how that's related to the local policy and management. My interest is in training people how to research so they can acquire information, interpret it, and apply it to problem-solving at the level of their own regions or watersheds.

GLOBE: *When you talk about acting locally, do you mean talking to local scientists? Governments? Businesses?*

Dr. Becker: One way that we have begun to solve some serious problems is to link the scientists, the regulators, the polluters and the

people who have a stake in healthy living in the bioregion. There are GLOBE students who are sitting down with people in their communities and saying, "Look, we have a problem. How can we work together to solve it?" So I look at how the system works, what people need to know and how can they get that information to solve the problem.

GLOBE: *Is science at the root of this kind of change?*

Dr. Becker: Absolutely. Science is where you start to understand the problem. You have to get at its causes and effects, and then assess how to address it. Science is essential as a systematic approach to the acquisition of information and its evaluation.

GLOBE: *How does science acquire this information?*

Dr. Bartlett: One way is to set up networks of data collection. To give you an example, back in the 1950s, when David Keeling set up a monitoring station for carbon dioxide concentrations in the atmosphere in Mauna Lau, Hawaii, nobody had any idea that we had already begun to affect global atmospheric carbon dioxide concentrations. It was only after 15 or 20 years of data collection that people began to see this clear trend of increasing CO_2 levels. With GLOBE sites, we may well be able to identify trends.

Dr. Bartlett: One way GLOBE will be influential is by educating the students who will someday be policy makers. They will be the politicians who will hopefully make better-educated decisions than are currently being made because they've been introduced to science; they've studied their own environments; they've taken these measurements; and they know how the data is interrelated. I think they will have a much better understanding than we did when we were kids.